Variation in own brand penetration: the role of advertising

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Introduction

- Interested in retailers’ provision of own brand products: own brand makes up around 60% of total sales in large supermarket chains
- The share of own brand is stable over time, but varies considerably across product category
- Develop a model that relates retailers’ and manufacturers’ incentives to advertise their products with how advertising affects consumer choices
- Explore how we can take the theory to data
Introduction

• Consider how advertising can affect demand:
  1. Predatory effect of advertising: the extent to which advertising a product captures market share from its rivals
  2. Expansionary effect of advertising: the extent to which total advertising increases demand for all products in a category

• Show that a bigger predatory effect of advertising is associated with lower own brand penetration
Theory

- Hotelling framework; two goods, each produced by a different manufacturer
- A monopolistic retailer who is responsible for advertising good 2 as an own brand, with good 1 advertised by its manufacturer as a national brand
- Timing:
  1. The retailer and national brand manufacturer simultaneously exert advertising efforts, $e_i$, at a cost, $e_i^2$
  2. The manufacturers set wholesale prices
  3. The retailer sets retail prices, $p_1^r$ and $p_2^r$
- Assume the market is covered, and some of each good is bought
• Unit mass of consumers, with valuation, $V_i$ of each good $i$:

$$V_i = V_0 + a_p(e_i - e_{-i}) + a_c(e_1 + e_2)$$

• where $V_0$ is the baseline attractiveness of the category, and $a_p, a_c$ represent the predatory and expansionary effects:

$$V_1 - V_2 = 2a_p(e_1 - e_2)$$
$$V_1 + V_2 = 2V_0 + 2a_c(e_1 + e_2)$$

• How do the incentives to advertise depend on $V_1$ and $V_2$?
Equilibrium

- Solve for the equilibrium profit of the retailer and the manufacturer, and the market share of $i$:

  **Retailer’s profit:**  
  $$\Pi^R = \frac{(V_1 + V_2)}{2} + \frac{(V_1 - V_2)^2}{72} - \frac{5}{2}$$

  **Manufacturer $i$’s profit:**  
  $$\Pi^M_i = \frac{(6 + V_i - V_{-i})^2}{36}$$

  **Market share of $i$:**  
  $$s_i = \frac{1}{2} + \frac{(V_i - V_{-i})}{12}$$
How does advertising affect the equilibrium?

- Advertising of product 1 (undertaken before the two pricing stages) affects the values of $V_1$ and $V_2$:
  1. by increasing $V_1 - V_2$: i.e. the relative attractiveness of 1
  2. by increasing $V_1 + V_2$: i.e. the overall attractiveness of the product category
How does advertising affect the equilibrium?

- Equilibrium profits:

\[
\Pi^R = \frac{(V_1 + V_2)}{2} + \frac{(V_1 - V_2)^2}{72} - \frac{5}{2}
\]

\[
\Pi_1^M = \frac{(6 + (V_1 - V_2))^2}{36}
\]

1. by increasing \( V_1 - V_2 \):
   - manufacturer 1 benefits from an increase of \( V_1 - V_2 \)
   - the retailer is interested in \(|V_1 - V_2|\) - having one brand more attractive than the other allows for more efficient price discrimination
   - If this effect is strong, then the NB advertiser will want to advertise a lot, making its brand very attractive
How does advertising affect the equilibrium?

• Equilibrium profits:

\[
\Pi^R = \frac{(V_1 + V_2)}{2} + \frac{(V_1 - V_2)^2}{72} - \frac{5}{2}
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\[
\Pi^M_1 = \frac{(6 + (V_1 - V_2))^2}{36}
\]

2. by increasing \( V_1 + V_2 \):

• An increase in this is beneficial to the retailer, but not the manufacturers, who still compete in wholesale prices with equal intensity

• This would suggest retailers have stronger incentives to advertise than manufacturers: OB penetration is likely to be substantial
Predictions from the theory

• Key prediction:
  **OB penetration should be smallest when the predatory effect of advertising is large**

• How can we look at this in the data?
1. Brand shares:
   - Kantar Worldpanel: records data on grocery purchases in the UK e.g. food in the home, alcohol, toiletries, household products
   - Collected for a rolling panel of around 25,000 households; daily 2002-2012
   - Products identified as branded, standard own brand and budget own brand (aggregate the own brand types)

2. Advertising expenditure:
   - A.C. Nielsen Digest of Advertising
   - all advertising expenditure in the UK
   - includes adverts on TV, radio, in the press, on billboards and online
   - monthly 2002-2012; by brand
Own brand penetration across category

Notes: quantity share across the big four supermarkets (Tesco, Sainsbury's, Asda and Morrisons)
Own brand penetration across category

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Own brand penetration across supermarket

![Graph showing market share of own brand for different supermarkets over time.](image)

- **Morrison's**
- **Sainsbury's**
- **Tesco**
- **Asda**
Empirical approach

- Interested in the $a_p$ parameter: the extent to which advertising by a rival affects own market share

- Estimate:

$$s_{it} = \beta_1^s p_{it} + \beta_2^s \bar{p}_{jt} + \gamma_1^s a_{it}^{1/2} + \gamma_2^s \bar{a}_{jt}^{1/2} + \eta_i^s + \tau_t^s + e_{it}^s$$

from share and advertising data for different product categories

- Calculate the following elasticity:

$$\epsilon_{ij}^{ap} = \frac{a_j}{s_i} \frac{\partial s_i}{a_j}$$
Preliminary results

![Graph showing market share of own brand against predatory advertising elasticity for different categories and stores.](image)
Extensions

- The primary variation in own brand penetration is across product lines, but also observe different types of retailers following different strategies.
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Extensions

- Some own brand products are designed to look very similar to their national brand equivalents?

- How can we think about this in the context of the model?
Extensions

- Extend the model to incorporate variation in other parameters of interest
- In a more general form of the model, relax the assumption of having only one monopolistic retailer:
  - Advertising allows retailers to ‘capture’ consumers from other stores
  - Allow retailer size to enter the model
  - The baseline attractiveness of a category, $V_0$, is allowed to vary across stores
- Consider the difference between standard versus budget own brand
Summary

- Develop a model that seeks to explain variation in own brand penetration by the nature of advertising
- Find that a bigger predatory effect of advertising is associated with lower own brand penetration
- Further work:
  - theory
  - link between theory and empirics: what to estimate, do for more categories, econometrics issues